## Year 12 Chemistry

| Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
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| **Topic 1: Atomic structure and Periodic Table**<br><br>**Topic 2a: Bonding & Structure**<br><br>**Topic 5: Formulae, Equations and Amounts of Substance** | **Finish Topic 2 and 5**<br><br>**Start**<br>**Topic 3: Redox**<br><br>**Topic 4: Elements of Group 1 & 2 and 7** | **Finish Topic 4**<br><br>**Start**<br>**Topic 6: Organic Chemistry I**<br><br>**Topic 7: Analytical Techniques I** | **Finish Topic 6**<br><br>**Start**<br><br>**Topic 8: Energetics I**<br><br>**Topic 9: Kinetics I** | **Finish Topic 8 and 9**<br><br><br>**Start**<br>**Topic 10: Equilibrium I** | **Start**<br><br>**Topic 11: Equilibrium II**<br><br>**Topic 13: Energetics II** |
| **Assessment:**<br>**Transition test (EOT for Topic 1 and 5 done so far)**<br>**CPAC 1** | **Assessment:**<br>**Topic 2 EOT**<br>**Christmas assessment (1,2 and 5)**<br>**CPAC 2 and 3** | **Assessment:**<br>**Topic 3 EOT**<br>**Topic 4 EOT**<br>**Topic 6abc EOT**<br>**Topic 7 EOT**<br>**CPAC 7** | **Assessment:**<br>**Topic 6de EOT**<br>**CPAC 4, 5 and 6**<br>**CPAC 8** | **Assessment:**<br>**Topic 9 EOT**<br>**Topic 8 EOT**<br>**Topic 10 EOT**<br>**PPE Paper 1**<br>**PPE Paper 2** | **Assessment:**<br>**Topic 11 EOT**<br>**Topic 13 EOT** |
| **Builds upon:**<br><br>Relative mass and charge of subatomic particles, atomic structure, atomic mass number, relative atomic mass calculations, isotopes, using periodic table, electron configurations.<br><br>Metallic ,ionic and covalent bonding, dot and cross diagrams, physical properties of types of structure<br><br>Use appropriate apparatus to measure masses and volumes, recording values to the appropriate precision. Converting between different units of mass and volume. Writing and balancing chemical equations using state symbols. Using the mole as a unit of the amount of substance. | **Builds upon:**<br><br>How metals and non-metals react, oxidation, reduction, redox reactions<br><br>trends of Group 1 and 7, symbol and ionic equations, redox reactions, oxidation number | **Builds upon:**<br><br>Simple organic naming, homologous series and general formula, oxidation of ethanol, empirical and molecular formula, structural formula<br><br>Use mass spec to determine Ar and Mr, structural formula of organic compounds | **Builds upon:**<br><br>Exothermic and endothermic reactions, energy level diagrams, determining temperature changes in chemical reactions<br><br>Factors affecting rates of reaction, catalysts, experiments measuring rate of reaction, collision theory | **Builds upon:**<br><br>Reversible reactions, dynamic equilibrium, factors that affect the position of equilibrium | **Builds upon:**<br><br>reversible reactions and dynamic equilibrium; the qualitative effect of change in concentration, temperature and pressure on the position of equilibrium; deducing expression for Kc for both homogeneous and heterogeneous systems.<br><br>standard conditions of temperature and pressure for thermodynamic measurements; enthalpy changes and Hess's law; energy level diagrams and enthalpy profile diagrams; bond enthalpies and mean bond enthalpies. |

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| **Introduces:**<br><br>**Topic 1:** development of atomic model, evidence for quantum shells, subshells and orbitals, electronic configuration of first 36 elements, periodicity<br><br>**Topic 2:** dative covalent bonding, intermolecular interactions, hydrogen bonding, shapes, electronegativity and polarity of molecules, explaining physical properties<br><br>**Topic 5:** using moles to calculate mass, volume, concentration and formula, titrations, error and uncertainty, percentage yield and atom economy, observations | **Introduces:**<br><br>**Topic 3:** oxidation numbers, disproportionation, ionic half-equations, name compounds using oxidation numbers as Roman numerals, oxidising and reducing agents<br><br>**Topic 4:** Trends, reactions, solubility and thermal stability of Group 2 and 7, redox reactions, tests for anions and cations | **Introduces:**<br><br>**Topic 6:** use different formula to represent organic compounds, isomerism, combustion, reaction mechanisms, polymers, preparing and purifying organic compounds.<br><br>**Topic 7:** Using mass spec and infrared spectra to identify structures of organic compounds | **Introduces:**<br><br>**Topic 8:** enthalpy change, standard conditions, Hess's law, bond enthalpies<br><br>**Topic 9:** activation energy, maxwell-boltzman model, catalysts, reaction profiles | **Introduces:**<br><br>**Topic 10:** Factors affecting position of equilibrium and the effect on yield in industry, deducing expression for Kc for both homogeneous and heterogeneous systems. | **Introduces:**<br><br>**Topic 11:** calculating Kc, how to deduce and calculate an expression for Kp in terms of partial pressure; the quantitative effect of change in concentration; how to predict the effect of change in temperature on values of Kc and Kp; how to predict the effect of a change in temperature on the position of equilibrium in terms of changes to Kc and Kp; why the value of an equilibrium constant is not altered by the addition of a catalyst.<br><br>**Topic 13**: Lattice energies and Born-Haber cycles; enthalpy changes of atomisation, solution and hydration; electron affinity; polarisation of anions by cations to explain the degree of covalent character of ionic compounds; entropy; Gibbs energy; the relationship between entropy, Gibbs energy and equilibrium constants. |

## Year 13 Chemistry

| Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
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| **Finish Topic 13**<br><br>**Start**<br>**Topic 14: Redox II**<br><br>**Topic 15: Transition Metals** | **Finish Topic 15**<br><br>**Start**<br>**Topic 12: Acid-Base Equilibria**<br><br>**Topic 17:Organic Chemistry II** | **Finish Topic 17 and 12**<br><br>**Start**<br>**Topic 16: Kinetics II** | **Finish Topic 16**<br><br>**Start**<br>**Topic 18: Organic Chemistry III** | **Finish Topic 18**<br><br>**Start**<br>**Topic 19: Analytical Techniques II** | |
| **Assessment:**<br>**Topic 13 EOT**<br>**Topic 14 EOT**<br>**CPAC 10,11 and 12** | **Assessment:**<br>**Topic 15 EOT**<br>**PPE Paper 1 with 3**<br>**PPE Paper 2 with 3**<br>**CPAC 9** | **Topic 12 EOT**<br>**Topic 17 EOT**<br>**CPAC 13a,b and 14** | **Topic 16 EOT**<br>**PPE Paper 1 with 3**<br>**PPE Paper 2 with 3**<br>**CPAC 15 and 16** | **Topic 18 EOT**<br>**Topic 19 EOT**<br><br>**External exams start** | |
| **Builds upon:**<br><br>Redox reactions, including disproportionation; calculating oxidation numbers; using oxidation numbers to balance chemical equations; using oxidation numbers to name compounds and write chemical formula.<br><br>Writing electronic configuration; using oxidation numbers to consider whether species are oxidised or reduced; how dative covalent bonds form; hot to predict the shapes of molecules and ions; the meaning of cis and trans in stereoisomerism; predict how changes in conditions affect the position of equilibrium. | **Builds upon:**<br><br>Reactions of acids and bases; a qualitative appreciation of the significance of pH of aqueous solutions; calculation of equilibrium constants based on concentrations; an understanding of the effect of changes of temperature on the value of the equilibrium constants.<br><br>How to use different kinds of formula to represent organic compounds; using IUPAC rules to name organic compounds; recognising different types of isomerism including geometrical isomerism; how to convert one organic compound into another; how to write reaction mechanisms. | **Builds upon:**<br><br>The concept of activation energy; the Maxwell-Boltzmann model of distribution of molecular energies; the role of catalysts in increasing the rate if chemical reactions; reaction profiles for both uncatalysed and catalysed reactions. | **Builds upon:**<br><br>How to use different kinds of formula to represent organic compounds; using IUPAC rules to name organic compounds; recognising different types of isomerism including geometrical isomerism; how to convert one organic compound into another; how to write reaction mechanisms. | **Builds upon:**<br><br>How to use mass spectrometry and infrared spectroscopy to determine the structures of organic compounds. | |

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| **Introduces:**<br><br>**Topic 14:** how to construct electrochemical cells and to calculate cell potential (emf); how to determine standard electrode (redox) potentials; sing standard electrode (redox) potentials to predict feasibility of chemical reactions; storage cells; redox titrations.<br><br>**Topic 15:** understand how the variety of oxidation numbers can be explained in terms of electronic configurations; the meanings of some new terms, such as ligand, complex, monodentate ad multidentate; how carbon monoxide prevents the transport of oxygen through the blood; the two different ways in which transition metals and their compounds can act as catalysts; how carbon monoxide and oxides of nitrogen are removed from vehicle exhausts by catalytic converters. | **Introduces:**<br><br>**Topic 12:** Acid-base reactions in terms of proton transfer; the relationship between hydrogen ion concentration and pH; how to calculate the pH of aqueous solutions; the difference between strong and weak acids; how to draw and interpret titration curves; how to select a suitable indicator for an acid-base titration; the concept of buffer solutions.<br><br>**Topic 17:** Chirality and optical isomerism; examples of converting one organic compound into another; different types of reaction mechanisms. | **Introduces:**<br><br>**Topic 16:** order of reaction and rate equations; selection of an appropriate technique to follow the rate of a reaction; initial rate and continuous rate methods for following reactions; reaction mechanisms; homogeneous and heterogeneous catalysis. | **Introduces:**<br><br>**Topic 18:** how aromatic compounds are different from aliphatic compounds; the similarities between manufacturing polyamides and the formation of proteins from amino acids.<br><br>. | **Introduces:**<br><br>**Topic 19:** the analytical technique of nuclear magnetic resonance spectroscopy | |